

**PREDICTIVE POLICING IN SEATTLE: THE EFFECTS ON LOCATION AND
TYPE OF CRIME**

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Abstract

Existing literature generally acknowledges that crime is not random and dispersed across different areas, but instead crimes cluster at specific locations. While there are extensive studies covering the effect predictive policing has on crime rates, there are only a handful of researchers studying the effects on location and type of crime. Using a quasi-experimental research design for identification, estimation, and inference of treatment effects at a designated cutoff, this project examines Seattle Police Department's implementation of predictive policing technology and its effects on precincts and types of crime throughout the city. The research suggests that the North, Southwest, and West precincts saw decreases in the number of reported crime incidences while serious crimes such as burglary and homicide saw overall reductions. The results of this project provide support for the city-level deployment of predictive policing programs specifically targeting high priority locations and types of crimes.

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1. Introduction

The use of predictive policing technologies is increasing as law enforcement agencies across the country attempt to counter constrained budgetary environments while increasing overall operational effectiveness. Different types of predictive policing technologies prioritize a wide variety of data points before employing target-specific methodologies for predicting crime. Most law enforcement agencies include some form of intelligence-driven strategies into their decision-making models since intelligence itself is a systematic approach to collecting information and predicting crime.¹ This paper examines one of the most common predictive policing approaches which involves hot-spot analysis. This predictive policing approach is prevalent across many law enforcement entities and involves increasing law enforcement presence at targeted locations using both historical and present data.

Studies suggest that crime incidents occur due to direct interactions between environmental conditions and the decisions made by offenders and victims.² The hot-spot approach to predictive policing aims to disrupt the environmental conditions of these incidents, typically using an increased law enforcement presence as a deterrent. Most law enforcement agencies employing hot-spot predictive policing strategies typically concentrate significant resources at targeted locations and effectively reduce crime at

¹ Gottschalk, Petter. "Organizational Structures Predictor of Intelligence Strategy Implementation in Policing." *International Journal of Law, Crime and Justice*, (2008):36: 184-195

² Mohler, G.O. and M.B. Short, Sean Malinowski, Mark Johnson, G.E. Tita, Andrea L. Bertozzi, P.J. Brantingham. "Randomized Controlled Field Trials of Predictive Policing." *Journal of the American Statistical Association*, (2015): 110: 512

those locations and sometimes to adjacent locations.³ However, while many studies show that targeting hot-spots leads to reductions in the number of crime incidents, displacement of crime and the effects on specific types of crime may be less common than what was previously accepted throughout existing literature.⁴

Utilizing regression discontinuity (RD) design models, this project examines Seattle Police Department's implementation of hot-spot predictive policing technology over three years and the effect it had on crime levels and types of crime reported at each of its five police precincts. Multivariate models of crime hot-spots typically include fixed environmental variables such as demographics, income levels, and distance to crime attractors to augment variables defined by the number of crime incidents.⁵ This project follows these guidelines by including environmental variables relating to race, household information, and housing occupancy in addition to the number of crime incidents reported across three years.

Key findings of this paper suggest that the implementation of predictive policing has benefitted Seattle by reducing overall crime across different precincts in the city. There are notable decreases in the number of crime incidents for certain classifications of crime with only marginal effects on others. However, while some precincts saw overall decreases in the number of reported crime incidents, others saw slight increases. These findings can potentially help formulate more well-rounded government policies regarding

³ Ibid.

⁴ Short, Martin B., and Jeffrey Brantingham, Andrea L. Bertozzi, George E. Tita. "Dissipation And Displacement Of Hotspots In Reaction-Diffusion Models Of Crime." *Proceedings of the National Academy of Sciences of the United States of America*, (2010): 107:9

⁵ Mohler, G.O. and M.B. Short, Sean Malinowski, Mark Johnson, G.E. Tita, Andrea L. Bertozzi, P.J. Brantingham. "Randomized Controlled Field Trials of Predictive Policing." *Journal of the American Statistical Association*, (2015): 110: 512

predictive policing and include additional actions that might be useful in targeting certain locations and types of crime beyond general police presence. For example, to aid law enforcement in targeting narcotic crimes at a hot-spot location, government entities could offer mobile drug treatment centers nearby to create a two-pronged approach to reducing narcotic crimes in that specific area.⁶ This paper aims to break down the effectiveness of Seattle's predictive policing program and offer a way ahead for decision-makers looking to augment existing law enforcement policies.

2. Literature Review

The reduction in crime using innovative techniques and processes has existed for years. With the advent of new technology utilizing ever-growing streams of data, predictive policing has become one of the latest methods many law enforcement entities use to proactively target high crime locations. Predictive policing involves the use of information technology to limit crime in specific areas.⁷ The data used for analysis can consist of information from multiple sources to include historical crime statistics, criminology theory, and predictive algorithms.⁸

There are two prevalent models in existing literature regarding predictive policing: the near repeat model and the risk terrain model. The near repeat model suggests that once a location has been subjected to crime, it is statistically more likely

⁶ Sherman, Lawrence W. "Hot Spots Of Crime And Criminal Careers Of Places." In *In Crime and Place: Crime Prevention Studies*, by John E. Eck and David Weisburd. Monsey: Willow Tree Press. (1995): 35-52

⁷ Ferguson, Andrew Guthrie. "Predictive Policing And Reasonable Suspicion." *Emory Law Journal*, (2012): 62: 259-313

⁸ Ibid.

that the location will see additional crime for a short time period afterwards.⁹ Risk terrain modeling involves identifying key indicators of crime and mapping those indicators using overlays. Both models have their own strengths and weaknesses requiring due diligence when applied to studies and analysis.

Previous policing techniques involved a variety of methods in attempting to deal with specific problem sets. Many of these approaches sought out underlying issues that traditional policing models failed to address.¹⁰ Problem-oriented, community, and third-party policing methods all involve use of support elements such as career and substance abuse counselors to help address behavioral and social problems. Many of these behavioral problems and the methods to treating them have generally existed outside the scope of traditional law enforcement training.

Building upon established hot-spot policing principles that suggest crime is often clustered into discrete hot-spots, predictive policing aims to shift available resources to specific locations in an attempt to deter and reduce crime in the targeted areas.¹¹ This method of policing has proven to be popular due to the fact that police strategies and policies remain unchanged. Instead, police can often focus on select areas of potential high crime and prioritize resources more efficiently.¹² Additionally, law enforcement entities are already familiar with the basic premise of hot-spot policing, which involves surging additional resources to specific areas in response to a perceived threat.¹³ Most

⁹ Ibid.

¹⁰ Braga, Anthony A. and David L. Weisburd. "Police Innovation And Crime Prevention: Lessons Learned From Police Research Over The Past 20 Years." Washington, DC: National Institute of Justice, U.S. Department of Justice (2007).

¹¹ Ibid.

¹² Ibid.

¹³ Braga and Weisburd. "Police Innovation And Crime Prevention", (2007).

hot-spot policing studies have shown that there is a reduction in crime for treatment hot-spot areas compared to control conditions where there is no predictive policing initiatives being deployed.¹⁴

It is generally acknowledged in existing literature that crime is not random and dispersed across different areas, but rather clustered at specific locations.¹⁵ Recent examples include a study identifying that half of the crime in Seattle over a fourteen-year period could be isolated to only 4.5% of city streets.¹⁶ In another study, researchers in Minneapolis found that 3.3% of street addresses and intersections generated 50.4% of all dispatched police calls for service.¹⁷ While there is a large amount of evidence that hot-spot policing is effective in lowering crime rates, there are some studies that have measured slightly adverse effects to the policing method.¹⁸ Specifically, researchers have studied whether offenders can recognize long-term enforcement of targeted areas and adjust their planned crimes accordingly.¹⁹ Regardless, majority of studies have shown that most forms of predictive policing at targeted hot-spots resulted in a decrease in crime compared to similar hot-spots not exposed to predictive policing initiatives.²⁰

Location has recently become a key factor when analyzing crime and the effects associated with it. Traditional criminology theory has focused on individuals and neighborhoods as specific units of analysis.²¹ Theories were based around human

¹⁴ Ariel, Barak and Henry Partridge. "Predictable Policing: Measuring the Crime Control Benefits of Hotspots Policing at Bus Stops." *Journal of Quantitative Criminology*, (2016): 1-25.

¹⁵ Ferguson, "Predictive Policing and Reasonable Suspicion", (2012).

¹⁶ Ibid.

¹⁷ Ibid.

¹⁸ Ariel and Partridge. "Predictable Policing: Measuring", (2016).

¹⁹ Ibid.

²⁰ Ibid.

²¹ Sherman, Lawrence W. "Hot Spots Of Crime And Criminal Careers Of Places." In *In Crime and Place: Crime Prevention Studies*, by John E. Eck and David Weisburd. Monsey: Willow Tree Press. (1995): 35-52

motivation and what social aspects had an effect on crime. However, a growing body of evidence has started to reveal that locations are playing a more prominent role in crime, which led to the creation of the often-referenced crime triangle.²² Using a standard equilateral triangle with three sides, the crime triangle is depicted with one side identified as the target of crime, another side identified as the offender, and the last side of the triangle identified as location. In recent literature, this basic model of crime analysis is being used to explore related variances among the three points to include frequency and rate of crime in specific areas with some studies showing that future crime is six times more predictable by address than by the identity of the offender.²³

The literature on crime dispersion, also referred to as crime displacement, can be narrowed down to handful of researchers studying different effects of dispersion and its relationship with hot-spot policing. Most recent studies suggest that crime relocates to a new location following crime prevention policies only a small number of times.²⁴ Most studies conclude that crime is not spatially dispersed to nearby areas because of predictive policing initiatives, which runs counter to some theories regarding the subject.²⁵

Part of the reason why crime decreases in targeted areas is due to the perceived certainty of punishment associated with less crime according to multiple research studies

²² Ibid.

²³ Ibid.

²⁴ Johnson, S.D., Guerette, R.T. & Bowers, K. J. "Crime Displacement: What We Know, What We Don't Know, And What It Means For Crime Reduction." *Journal of Experimental Criminology*, (2014): 10: 549-571.

²⁵ Weisburd, David L. and Laura A. Wyckoff, Justin Ready, John E. Eck, Josh Hinkle, Frank Gajewski. "Does Crime Just Move Around the Corner? A Study of Displacement and Diffusion in Jersey City." NJ, Washington, DC: National Institute of Justice, U.S. Department of Justice (2004)

on the subject.^{26, 27} Many of these studies focus on the rational choice approach that covers an offender's willingness to commit crimes based on a number of factors to include benefits, rewards, and costs.²⁸

To further support the idea that crime displacement is limited to a minority of cases, researchers have provided empirical support that suggests crime anchors at certain locations and is therefore resistant to displacement in the first place.²⁹ In one study, researchers identified that some locations received low amounts of crime while other locations received large amounts of crime. Their findings suggest that characteristics of places influence the level of crime and that there are limited reasons why crime offenders would move to other areas unless the new areas shared similar characteristics.³⁰

In addition to lowering crime in the targeted areas, some studies have presented the idea that predictive policing initiatives could potentially reduce the crime levels in areas not included in the initial targeted areas.³¹ This reverse dispersion effect is sometimes referred to as crime control benefit or the free rider effect. The main drivers behind this effect is that crime offenders are uncertain if the increased risk is worth it in

²⁶ McCarthy, Bill. "New Economics of Sociological Criminology." *Annual Review of Sociology*. (2002): 28:417-42

²⁷ Tonry, Michael. "Learning from the Limitations of Deterrence Research." *Crime and Justice*. (2008): 37:279-311

²⁸ McCarthy, Bill. "New Economics of Sociological", (2002)

²⁹ Weisburd, David L. and Telep, Cody W. "Spatial Displacement And Diffusion Of Crime Control Benefits Revisited: New Evidence On Why Crime Doesn't Just Move Around The Corner." In N. Tilley and Farrell, G. (Eds.). *The Reasoning Criminologist: Essays in honour of Ronald V Clarke*. New York: Routledge. (2012)

³⁰ Weisburd, David L. and Telep, Cody W. "Spatial Displacement And Diffusion", (2012)

³¹ Clarke, Ronald. V., and Weisburd, David L. "Diffusion of Crime Control Benefits: Observations on the Reverse of Displacement." In *Crime Prevention Studies*, ed. Ronald V. Clarke, Vol. 2. Monsey: Criminal Justice Press. (1994)

areas closely located near predictive policing areas and are discouraged when changing targets would involve extra effort or minimal gain in rewards.³²

Nevertheless, in cases where crime dispersion does take place, researchers have tried to identify some of the causes behind the dispersion. Specifically, researchers have evaluated the possibility that in response to predictive policing initiatives, crime offenders may seek out other opportunities at other locations (spatial displacement), at other times (temporal displacement), or other targets (target displacement).³³ This also includes crime type displacement where one type of crime might be prevented by predictive policing initiatives, giving rise to another crime that has a perceived increase in success for the crime offender.³⁴

Despite multiple studies covering predictive policing methodologies, there is room to explore the effects predictive policing policies have on locations and how these effects can potentially impact future policy decisions. This research will utilize a RD model to study the effects predictive policing has on location and types of crime. Many factors are instrumental in shaping whether an area sees an increase or decrease in overall crime levels and this research aims to examine any possible causal effect between predictive policing and crime levels at targeted locations.

3. Data and Methods

³² Clarke, Ronald. V., and Weisburd, David L. "Diffusion of Crime Control", (1994)

³³ Ariel and Partridge. "Predictable Policing: Measuring", (2016).

³⁴ Ariel and Partridge. "Predictable Policing: Measuring", (2016).

The data used for this research project was provided by the City of Seattle and covered crime statistics by police precincts from 2008-Present. The dataset itself contains over 27,000 observations, but for this research project was reduced to 7,848 observations covering the time period from 2012-2014. The dataset's primary field, known as the "stat value", measures the number of incidences a particular crime occurred in each of Seattle's Police beats on a given date. Each beat corresponds with a police precinct and date that the crime incidents occurred.

The types of crime measured in the dataset are listed as homicide, rape, robbery, assault, larceny, motor vehicle theft, and burglary. There are no identifiers that designate lesser degrees of certain crimes, so a 3rd degree assault is recorded the same as a 1st degree assault within the dataset. While it might seem problematic at first glance, this research project aims to identify general trends in program effectiveness and differentiating between different degrees of crimes would be too specific for the general scope of this research project. However, changing data collection procedures to include all crime classifications would provide future research opportunities to measure any irregularities that might exist between serious and minor crimes. For instance, if a predictive policing program successfully reduces assaults in a given area, it would be beneficial to measure the effect on all types of assault to get a better estimation of the program's overall impact.

With regard to modeling, this research project employed RD models as a way to estimate the treatment effects of Seattle's predictive policing program that was implemented on 01 April 2013. The program was first implemented in a couple neighborhoods located in the West precinct before being introduced throughout the entire

city in the following months on a rolling basis. Due to the nature of the program's implementation over a few months in different areas, it would be impractical to study the effects of the program using only a month's worth of observations. This issue facilitated the employment of an RD model for further analysis because the model allows for more flexibility due to the lack of specific details regarding when and where Seattle started introducing predictive policing initiatives.

RD modelling was first developed in 1960 as a method to estimate treatment effects in a non-experimental setting and is particularly useful when program specific information is lacking.³⁵ Within a RD model, the treatment is determined if a running variable exceeds a known cutoff point.³⁶ For this research project, the running variable selected was the time period of 2012-2014 measured in individual numeric units. The cutoff point was designated at "64", which represented the program's start date on 01 April 2013. Models were developed using the number of crime incidents as the primary dependent variable broken down by location and type of crime.

Part of RD modelling involves construction of plots that provide a graphical representation of the underlying data and research design. These graphs can be used to visually depict the discontinuity effect and the inclusion of polynomial lines can provide an idea of the underlying regression function of the model. While graphs were produced for each model, only the most significant ones were included in the results. The last step

³⁵ Thistlethwaite, Donald L.; Campbell, Donald T. "Regression-Discontinuity Analysis: An Alternative To The Ex Post Facto Experiment." *Journal of Educational Psychology*, (1960): 51(6): 309-317

³⁶ David S. Lee and Thomas Lemieux, "Regression Discontinuity Designs in Economics", *NBER Working Paper*, (2009): 14723

involved analysis of the estimated treatment effects which includes computing bandwidth selectors, variance-covariance matrix, and RD estimates.³⁷

4. Results

For this research project, analysis of the models focused on the precinct-level. Precincts were large enough to have their own trends while small enough to provide accurate insights into the crime situation in their respective section of the city. One issue previously mentioned regarding the research project is that the predictive policing program in Seattle was initially implemented in the West precinct before being introduced across the entire city in the following months. This made it difficult to pinpoint which specific areas may have seen an increase in crime directly attributed to predictive policing initiatives. Because of this, the research project focused on evaluating the predictive policing program and the possible effects it had on crime levels based on location and type of crime. Additionally, while crime dispersion could not be precisely measured, general assumptions were included to explain possible dispersion effects relating to location and types of crime.

Regarding RD analysis, initial estimates using graphs is the ideal way to observe the effect of the treatment and any potential discontinuity in the outcome. In Figure 1, the RD Plot provides an overall view of the entire dataset, which includes the number of crime incidents over a three-year period for the city of Seattle. As previously mentioned, the RD model facilitates the identification and estimation of treatment effects near a

³⁷ Sebastian Calonico, Matias D. Cattaneo, Rocio Titiunik, “Robust Data-Driven Inference In The Regression- Discontinuity Design,” *The Stata Journal*, (2014) 14(4): 909–946

specific cutoff. This research project utilizes a cutoff point at “64”, a numeric designation for 01 April 2013, which is when the predictive policing program was first implemented. The cutoff point for the RD Plot is designated as the vertical red line and all units above the cutoff are assigned to treatment (predictive policing coverage) while units below the cutoff are assigned to control (no predictive policing coverage).

The break, depicted as the space between both polynomial trend lines, is the RD treatment effect and can be used to analyze the effect of the treated units on the overall outcome. As depicted in Figure 1, there is a positive effect with the treated units and a marginal increase in overall instances of crime across the entire city after the predictive policing program was implemented. This does not mean the predictive policing program failed to reduce crime because the overall RD Plot includes a wide bandwidth for all observations, does not include additional covariates, and is susceptible to high levels of bias. The key takeaway from Figure 1 is that there is a clear discontinuity present and additional modelling refinements will be required to provide estimates that are more accurate.

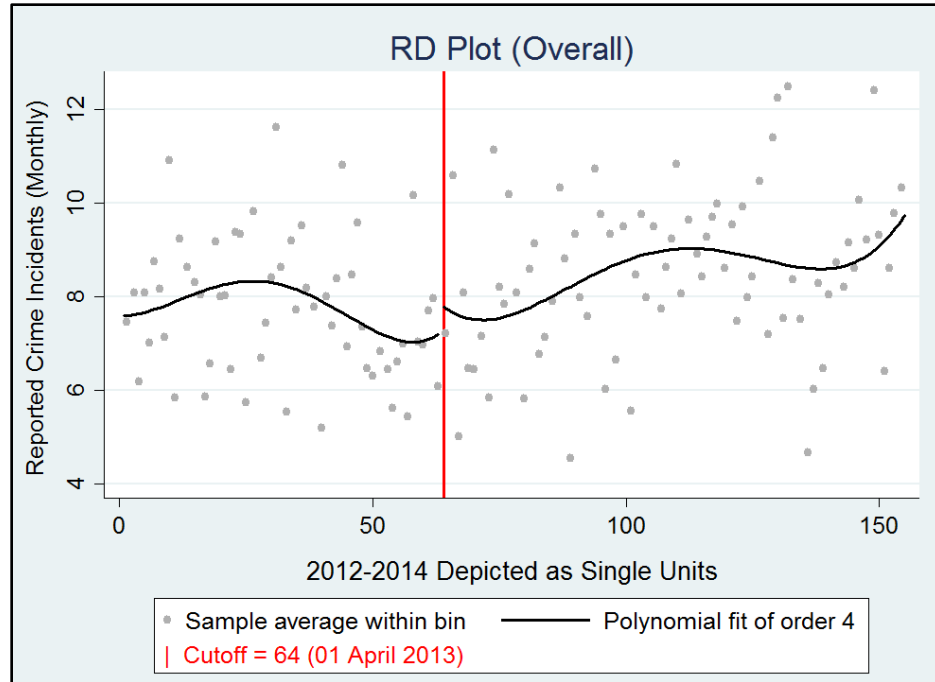


Figure 1.

4.1 Treatment Effect by Location

In Table 1, five different models were run for each precinct within the city. All the models utilized a 4th order parametric fit with a triangular kernel which is the recommended approach to running RD models.³⁸ The models also employed a mean-squared-error (MSE) optimal bandwidth implementation that is recommended as a baseline measure.³⁹ North, Southwest, and West precincts saw reduced treatment effects in the number of reported crime incidents after the cutoff with North receiving the largest reductions across different models. East and Southeast precincts saw marginal increases in their respective treatment effect. As depicted in Table 2, including all point estimators,

³⁸ Imbens G. and Thomas Lemieux. "Regression Discontinuity Designs: A Guide To Practice." *Journal of Econometrics*, (2008):142:615–35.

³⁹ Calonico S. and Matias D. Cattaneo, Rocio Titiunik. "Robust Nonparametric Confidence Intervals For Regression-Discontinuity Designs." *Econometrica* (2014): 82(6):2295-2326

variance estimators, and confidence intervals showed a marginal effect on the RD estimates with no significant changes for any of the precincts.

Table 1: Predictive Policing Effects on Precinct Models

Variables	(1) East	(2) North	(3) Southeast	(4) Southwest	(5) West
RD-Estimate	.57	-1.77	.78	-.28	-1.08
Observations	1380	2310	1386	924	1848
Robust 95% CI	[-2.62, 3.76]	[-6.08, 2.54]	[-2.45, 4.01]	[-4.51, 3.94]	[-5.30, 3.13]
Kernel Type	Triangular	Triangular	Triangular	Triangular	Triangular
BW Type	mserd	mserd	mserd	mserd	mserd
Conventional Std. Error	1.63	2.20	1.65	2.16	2.15
Conventional p-value	.73	.42	.64	.90	.62
Order Loc. Poly. (p)	1.00	1.00	1.00	1.00	1.00
Order Bias (q)	2.00	2.00	2.00	2.00	2.00
BW Loc. Poly. (h)	25.92	18.62	18.85	16.32	23.68
BW Bias (b)	40.90	30.96	28.91	25.46	40.06

Table 2: Predictive Policing Effects on Precinct Models (All Estimations)

Variables	(1) East	(2) North	(3) Southeast	(4) Southwest	(5) West
Conventional	.57 (1.63)	-1.77 (2.20)	.78 (1.65)	-.28 (2.16)	-1.08 (2.15)
Bias-Corrected	.48 (1.63)	-2.39 (2.20)	.29 (1.65)	-.73 (2.16)	-1.60 (2.15)
Robust	.48 (1.93)	-2.39 (2.60)	.29 (2.00)	-.73 (2.62)	-1.60 (2.52)
Observations	1380	2310	1386	924	1848

Looking at the North precinct, Figure 2 depicts a RD plot that shows the North precinct seeing an increase in its RD estimate with an overall increase in the number of reported crime incidents. The post-treatment polynomial line indicates an increase in the number of reported crime incidents followed by a decrease before marginally increasing. The positive RD estimate in Figure 2 runs counter to the RD regression results found in

Table 1 and Table 2 that clearly show a decrease in the RD estimate for the North precinct. This situation indicates that it might be more beneficial to limit the bandwidth window and focus on the control and treated units closer to the cutoff point.

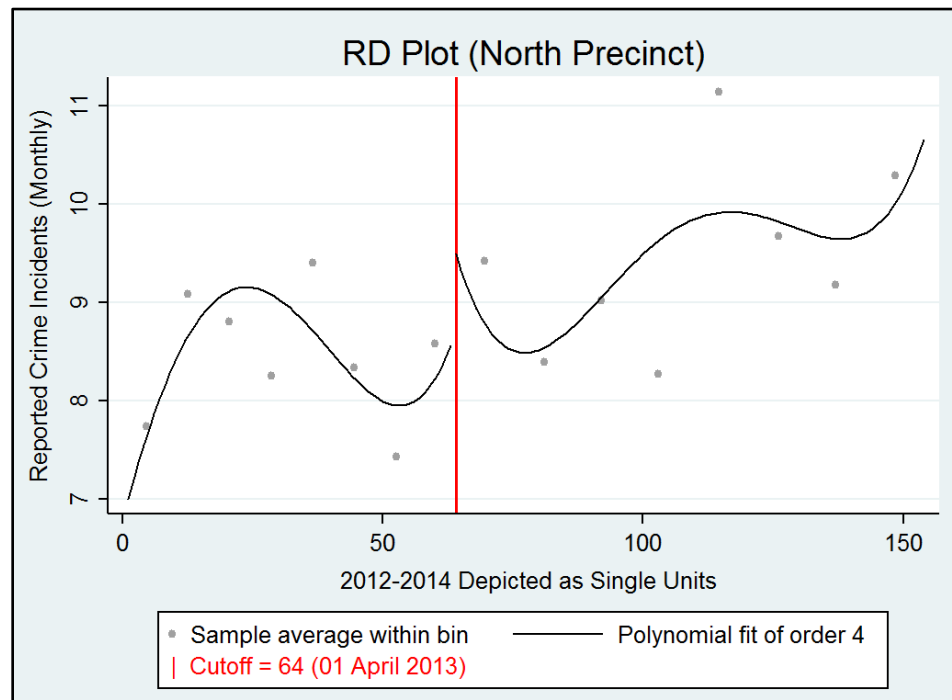


Figure 2.

After refining the model by limiting the bandwidth window to areas near the cutoff and running a triangular kernel function, Figure 3 provides a more accurate estimation that is much more in line with the RD regression output. A visible discontinuity exists followed by a sharp reduction in the post-treatment number of reported crime incidents indicating that the predictive policing program was successful in reducing overall crime in the North precinct.

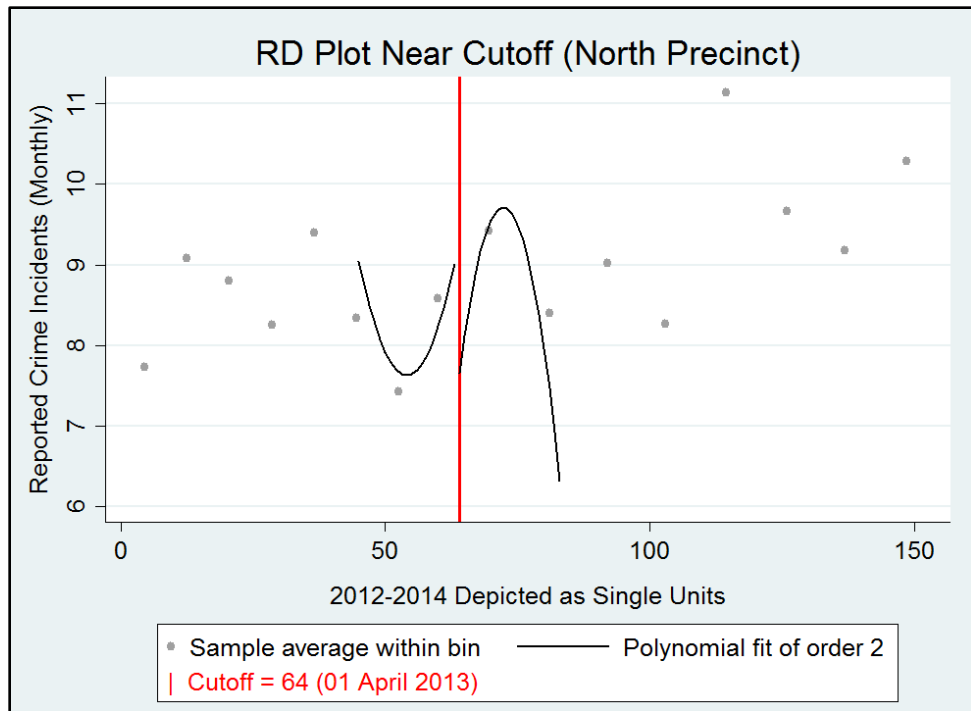


Figure 3.

4.2 Treatment Effect by Type of Crime

In Table 3, seven models were run to determine what effect Seattle's predictive policing program had on different types of crimes. Burglary, homicide, larceny, and robbery all decreased following the implementation of the predictive policing program. These results hold true when factoring in additional point and variance estimators as shown in Table 4.

Table 3: Predictive Policing Effects on Types of Crime

Variables	(1) Assault	(2) Burglary	(3) Homicide	(4) Larceny	(5) Motor Vehicle Theft	(6) Rape	(7) Robbery
RD-Estimate	.37	-2.17	-.10	-1.01	.83	.11	-.01
Observations	1121	1122	1121	1120	1122	1121	1121
Robust 95% CI	[-.85, 1.58]	[-5.51, 1.17]	[-.22, .02]	[-8.07, 6.05]	[-.76, 2.42]	[-.09, .32]	[-.76, .75]
Kernel Type	Tri	Tri	Tri	Tri	Tri	Tri	Tri
BW Type	mserd	mserd	mserd	mserd	mserd	mserd	Mserd
Conventional Std. Error	.62	1.70	.06	3.60	.81	.10	.38
Conventional p-value	.55	.20	.10	.78	.31	.27	.98
Order Loc. Poly. (p)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Order Bias (q)	2.00	2.00	2.00	2.00	2.00	2.00	2.00
BW Loc. Poly. (h)	21.44	22.80	20.503	15.95	19.59	13.82	26.16
BW Bias (b)	35.13	33.90	35.328	25.69	31.34	26.72	40.47

Table 4: Predictive Policing Effects on Types of Crime (All Estimations)

Variables	(1) Assault	(2) Burglary	(3) Homicide	(4) Larceny	(5) Motor Vehicle Theft	(6) Rape	(7) Robbery
Conventional	.37 (.62)	-2.17 (1.70)	-.10 (.06)	-1.01 (3.60)	.83 (.81)	.11 (.10)	-.01 (.38)
Bias-Corrected	.27 (.62)	-2.51 (1.70)	-.13 (.06)	-1.72 (3.60)	.74 (.81)	.15 (.10)	-.01 (.38)
Robust	.27 (.74)	-2.51 (1.99)	-.13 (.07)	-1.72 (4.38)	.74 (.81)	.15 (.12)	-.01 (.45)
Observations	1121	1122	1121	1120	1122	1121	1121

Of all the types of crimes measured, burglary saw the largest reductions. This significant effect could possibly be attributed to the Seattle Police Department originally prioritizing property crimes since it made up approximately 70% of the reported crimes

in the city.⁴⁰ As shown in Figure 4, there is a pronounced discontinuity at the cutoff with the post-treatment polynomial line indicating a general decrease in the number of reported incidences.

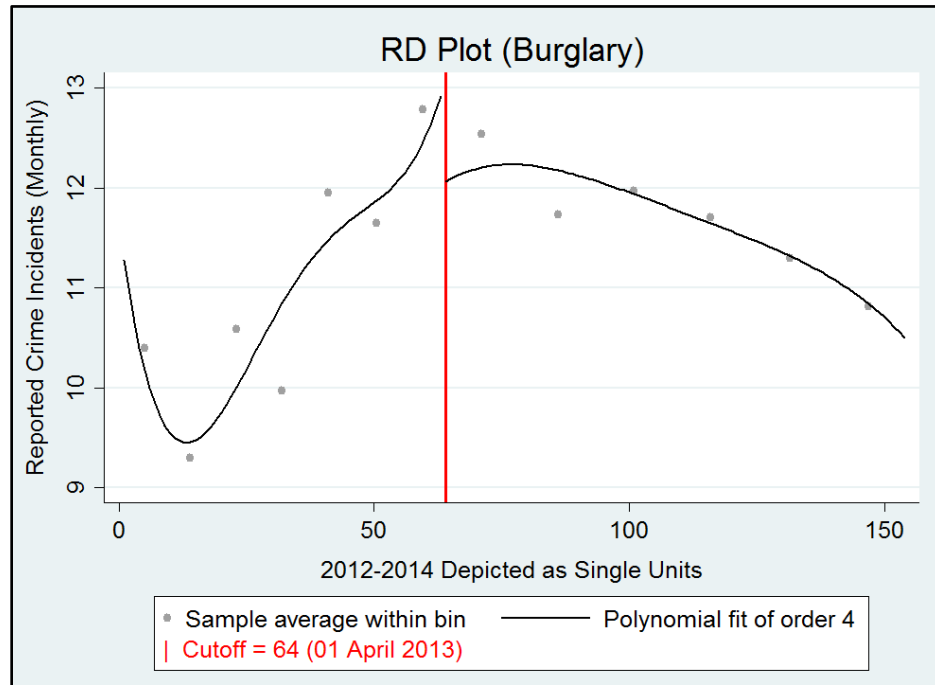


Figure 4.

When limiting the bandwidth window and running a triangular kernel function, Figure 5 shows a much larger discontinuity effect with a significant drop-off in the number of reported crime incidents. Just like with precincts, including a limited bandwidth window around the cutoff produced more accurate estimations and supports the RD output produced in Tables 3 and 4.

⁴⁰ George Mason University, Center for Evidence-Based Crime Policy, “Seattle Police Case Study,” <http://cebcp.org/evidence-based-policing/what-works-in-policing/seattle-police-case-study/>, (accessed March 10, 2017).

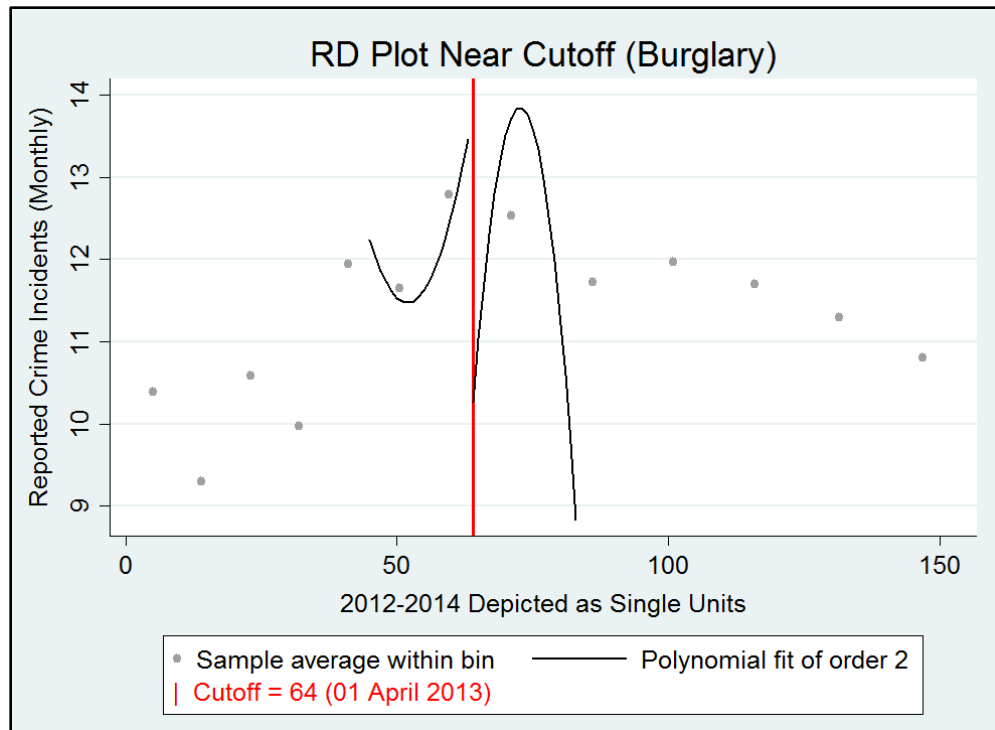


Figure 5.

5. Conclusion

The findings from this research project support the notion that predictive policing has a significant effect on crime level and types of crime at targeted locations. Not all locations saw decreases in the number of crime incidents reported, however this may possibly be attributed to an increase in the number of minor crimes such as assault. One could hypothesize that as additional Seattle Police Department patrols were initially directed to crime hot-spots related to property crimes, off-campus locations and other areas with similar characteristics might have seen increasing amounts of minor crimes such as assault. Alternatively, resources traditionally located at off-campus locations and other areas with similar characteristics, may have been shifted to support predictive

policing initiatives and therefore crimes that may have been prevented ended up being reported. Additionally, some areas of Seattle are historically known for high levels of crime and may require additional predictive policing measures in order to have any effect on the number of reported crime incidents.⁴¹ The Southeast precinct in particular is known for high levels of crime and the RD output indicated a marginal increase in crime levels. Nonetheless, any increases in reported crime incidents across the different precincts and types of crime were extremely marginal and may be due to some unknown variables that were not included in the RD models. The findings also support other organization's analysis on Seattle's predictive policing program in that the West precinct saw a significant decrease in the number of reported crime incidents, with other observers estimating a 60% decrease in the number of reported crime incidents.⁴²

Due to the lack of specific location-based data on Seattle's predictive policing program, it was difficult to measure accurate crime dispersion. Data required to perform analysis on crime dispersion in Seattle would require weekly patrol logs across all five police precincts in order to determine which areas were seeing an active hot-spot patrol. This is because Seattle Police Department implemented a dynamic targeting strategy by shifting hot-spot patrols on a weekly basis instead of a more long-term deterrence strategy.⁴³ Furthermore, Seattle's predictive policing program initially focused on property crimes such as burglary, before introducing other types of crime into its

⁴¹ The Seattle Times, "'Shots fired' calls on rise, Seattle police link some to single gun," <http://www.seattletimes.com/seattle-news/crime/spd-increases-patrols-works-with-atf-to-combat-spike-in-gunfire>, (accessed March 17, 2017).

⁴² Seattle Times, "Seattle Police Department's 'directed patrols' a good move," http://old.seattletimes.com/html/editorials/2018683647_edit14crimehotspots.html, (accessed March 17, 2017).

⁴³ George Mason University, Center for Evidence-Based Crime Policy, "Seattle Police Case Study," <http://cebcp.org/evidence-based-policing/what-works-in-policing/seattle-police-case-study/>, (accessed March 10, 2017).

predictive policing software.⁴⁴ This would explain why burglary saw the largest reduction in reported crime incidents and could explain the marginal effects on some other types of crime. Data regarding when other types of crime were introduced into the predictive policing software would help provide more accurate estimations of the program's effectiveness on types of crimes.

Future studies should explore the East and Southeast areas of Seattle specifically to determine what predictive policing methods are effective for areas that are historically known to be persistent hot-spots of various types of crime.⁴⁵ This may shed some light on additional variables that may be used in analytical models. Another avenue to explore would be the effects different types of predictive policing programs have on crime levels for different types of crimes. New technology is constantly being introduced and it would be value added to study what effect these predictive policing innovations have on different types of crimes.

The policy implications for introducing predictive policing vary based on an organization's priorities, but resource allocation and increasing operational effectiveness are two key reasons why law enforcement agencies should consider program implementation. For Seattle, curbing major crimes such as homicide and burglaries is important and is enough reason to continue funding its predictive policing initiative. The program also helps highlight critical areas that may not be seeing positive effects and can help decision-makers tackle the issue from a different perspective. For example, if

⁴⁴ City of Seattle, "Seattle Crime News: SPD Blotter," <http://spdblotter.seattle.gov/2013/05/17/spd-rolling-out-crime-forecasting-program-citywide>, (accessed March 17, 2017).

⁴⁵ The Seattle Times, "Shots Fired' Calls On Rise, Seattle Police Link Some To Single Gun," <http://www.seattletimes.com/seattle-news/crime/spd-increases-patrols-works-with-atf-to-combat-spike-in-gunfire>, (accessed March 17, 2017).

patrols and police presence are failing to reduce the number of reported crime incidents in predominantly high crime precincts, perhaps employing a different approach may be needed. One suggestion would be to introduce community outreach programs in conjunction with predictive policing measures to tackle high crime areas on two different fronts. Ultimately, it is likely going to take a combination of social and policing initiatives to address crime and implementing a predictive policing program is the one of the first steps in the process.

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7. Curriculum Vita

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